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AUTHOR Landberg, Ted
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ABSTRACT

This manual is intended to provide guidance to those interested in establishing an electronic bulletin board system (BBS) that enables users to send and read messages both individually and by teleconferencing, and to transfer files to and from the system. The manual begins with a definition of a BBS and explains its uses and facilities. It then gives instructions for starting and operating a BBS, including: (1) hardware requirements (microcomputers, modems, telephone lines, printer and a tape backup system); (2) software requirements (bulletin board system software, call analyzer software, and multi-tasking software); and (3) the selection of a system operator. Also discussed are the day-to-day operations of a BBS, including monitoring messages, refreshing bulletins or files, taking security precautions to safeguard the system, and analyzing bulletin board traffic. The appendices include a list of the functional features of a BBS, examples of the screen displays from the Microcomputer Electronic Information Exchange (MEIE) BBS, and an explanation of XMODEM file transfer procedures. It is noted that the MEIE is in the public domain and representative of similar commercially available products. (8 references) (DB)

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Electronic Bulletin Boards

U.S. DEPARTMENT OF EDUCATION
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Ted Landberg

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Institute for Computer Sciences and Technology
Gaithersburg, MD 20899

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NATIONAL BUREAU OF STANDARDS

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Ted Landberg

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U.S. DEPARTMENT OF COMMERCE, Malcolm Baldrige, *Secretary*
NATIONAL BUREAU OF STANDARDS, Ernest Ambler, *Director*

FOREWORD

The purpose of this report is to provide guidance to those interested in establishing an electronic bulletin board system. The material in this report is drawn from experiences operating one of these boards for the Institute for Computer Sciences and Technology, at the National Bureau of Standards, and helping many other organizations start new bulletin boards of their own. This report discusses the planning and resources needed to establish a successful bulletin board.

In March 1984, the Microcomputer Electronic Information Exchange (MEIE) was inaugurated using a software product called the "Remote Bulletin Board System." This information exchange system was to serve a growing federal and private sector constituency interested in receiving information about computer technology using their personal computers. By the end of its second year of operation, MEIE had recorded over 30,000 callers.

The electronic bulletin board system mentioned in this report was selected because the software is in the public domain and is representative of similar products available commercially. Because of the nature of this report, it was necessary to mention vendors and commercial products. The presence or absence of a particular trade name product does not imply criticism or endorsement by the National Bureau of Standards, nor does it imply that the products identified are necessarily the best available.

ELECTRONIC BULLETIN BOARDS

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1. Introduction

Computers are used to create, store and distribute information. Many managers are asking how can this computer based information be distributed outside the organization. Reprinting published materials is often not a satisfactory way of communicating information that ages rapidly. A distribution method that bypasses the time consuming and expensive processes to convert that information into a printed format and physically distribute it is needed. One solution has come from the community of microcomputer hobbyists who have created a peer to peer communications capability called an electronic bulletin board system.

The purpose of this report is to provide guidance to those interested in establishing an electronic bulletin board system. This report will provide the reader with some of the ways a bulletin board system may be used and the important management issues that must be resolved before establishing and operating a bulletin board.

1.1 Definition of a Bulletin Board

An **electronic bulletin board system** can be defined as a computer service offering callers with microcomputers or terminals a capability to post and read messages, and transfer files to and from the service.

This new information distribution channel appeared when:

- microcomputers and modems became inexpensive.
- bulletin board software was placed into the public domain making experimentation of this new form of communication attractive.

These electronic information exchange (bulletin board) systems are usually implemented on microcomputers connected to a public telephone network. Most use one of the many versions of public domain bulletin board software. Literally, hundreds of these bulletin boards exist in the United States. Most are operated by private individuals from their homes, but an increasing number of corporations and federal agencies are sponsoring these systems to disseminate information to the public.

1.2 Bulletin Board Uses

Electronic bulletin board systems can satisfy many low volume, intermittent data communication applications by taking advantage of the public telephone network; they also require no extensive support by a data communication professional. These systems have been useful where there is a geographically dispersed population

of computer users, and a requirement to exchange technical material in an accurate and timely way. Some applications which are particularly well suited for bulletin board systems are:

- Low volume data transfer from remote sites where timeliness is critical such as: orders, inventory counts, branch office financial and operating summaries, transcripts, and proposals.

- On-line product support of software changes and documentation corrections including lists of frequently asked questions, documented problems with solutions, and product announcements.

- One way information transfer - such as: press releases, product catalogs, and publication abstracts.

- Departmental messaging systems.

1.3 Bulletin Board Facilities

Bulletin board software is a highly specialized application designed to accomplish a rather limited set of functions. These features include sending and receiving messages, transferring files, and chatting with the system operator. However bulletin board systems do not support searching a textual data base by keyword, initiating other computer jobs or creating and editing new data files. A detailed discussion of these features can be found in the "Remote Bulletin Board System Documentation Manual" [MACK86]. A summary of the features available to callers found in a typical bulletin board are listed in Appendix A.

Three important facilities of a bulletin board system will be discussed in this section. These include caller sign-on, peer to peer communications and file transfer.

Caller Sign-on

When a caller makes a connection with a bulletin board, the system determines what the caller communication parameters are and adjusts its own communications. The caller is asked to identify themselves by entering a first and last name, and a caller validation process is initiated. If validation fails, the caller is considered new, and a special routine is begun to register that caller. An actual sign-on dialogue is shown in Appendix B.1.

Some traffic statistics are displayed to the caller. The total number of previous callers, number of active messages and the last message read, provide indicators of the amount of traffic since the caller's last session. For new users and novices a complete transaction menu is displayed. The caller's activities

are recorded in a special session log. Caller name, communication parameters, calling location and time of day, security violations, and file transfers are entered into the log. See Appendix B for sample listings of the caller profile facilities, activity log and identification files.

Peer to Peer Communications

Messaging

The heart of the bulletin board system is the message section. This is where callers can read the latest information other callers have experienced with software problems and their solutions, and can find the "burning" issues of the day. It is the most dynamic area and one that requires daily attention. The message section should be used for:

- making announcements about meetings
- highlighting new files in other sections
- asking and responding to questions.

It allows callers to contribute information to the general public. Consequently, there are some risks involved with operating an open message section. Callers may leave messages with which the sponsoring organization may not want to be associated.

A caller has several messaging options. The caller may create messages for the public or another registered caller, respond to a message, delete personal messages or scan the message file by message headers (authors and subject) or by full text.

Conferencing

Conferencing is the interchange of messages on a "topic or issue" by a closed group of individuals. Conferencing on a bulletin board has been adapted to confer a different level of access privileges to the "conference" group. Usually a message file is created for each conference which avoids the need for complex logic to identify messages by conference.

File Transfer Facilities

From the earliest versions of these bulletin boards, file transfer was considered an important feature. The ability to transfer a data file between computers has two advantages:

1. Binary (non-graphical character) files can be transferred

2. Files can be saved for reuse by receiver

The file section permits files to be moved between the callers system and the bulletin board system.

Transferring a file to a host computer by the caller is termed uploading, while receiving from a host computer is downloading. To transfer any file requires that a special dialogue be initiated on both computers. First the file must be found on the transferring computer's file directory, an appropriate transfer protocol invoked, and time allowed for the receiving computer to initiate its own procedure.

There are two types of file transfers common to most bulletin boards; ASCII[1] and binary data files. ASCII files contain the more familiar alphabetic and numeric characters which are readable on CRT screens which are a subset of the entire ASCII code set. Binary data files use 8 bit characters whose meaning must be interpreted by another computer program. Binary file transfers require that the receiving computer ignore the meaning of characters transmitted which may be control codes in communications sessions. Some special transmission procedures have been adopted to handle binary files. Data is transmitted in groups of 128 characters with an additional four characters used for block identification and error checking. An explanation of one such error checking scheme is found in Appendix C.

Generally, data files are found by using the file section menu which lists sub-directories. In general, bulletin boards do not have keyword search capability. Therefore information must be organized by using a series of menus or sub-directories to guide the caller to the appropriate section.

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[1] ASCII - American (National) Standard Code Information Interchange X 3.4 - 1968 is a 7 bit code consisting of 95 displayed characters and 32 non-displayed control characters.

2. Starting and Operating a Bulletin Board

The first part of this section will cover the planning and selection of resources and policies necessary to ensure successful operation of a bulletin board. The second part of the section will address day to day operations needed to maintain a bulletin board system. Much of the material is drawn from actual experience at the Institute for Computer Sciences and Technology at the National Bureau of Standards in operating the Microcomputer Electronic Information Exchange (MEIE) bulletin board. Examples based on the MEIE system have been used to describe many of the activities involved in starting and operating a bulletin board.

2.1 Establishing a Bulletin Board

The request to establish a bulletin board may be initiated by an employee who wants to provide an information exchange for either a group of their peers, or by an outside constituency interested in accessing special material an organization has to offer. Justification for establishing a board often is couched in terms of promoting improved service to clients, more timely distribution of information, establishing links with a community of personal computer users, or beginning to experiment with alternate forms of product delivery.

Usually, central computer alternatives either do not exist or would be prohibitively expensive to implement; thus; the impetus for using a microcomputer-based system is found. A microcomputer based electronic bulletin board system has the following characteristics which make it an attractive solution for many organizations.

- Initial investment in hardware, software and development is below $3,000.
- No risk of unauthorized disclosure of central computer data is present.
- Installation does not require services of data processing professional.
- Implementation does not require specialized communication network or hardware; in fact, components may already be in place.
- Software is mature and well-tested with thousands of hours of operation.

The establishment of a bulletin board requires the following: supporting hardware and software requirements, selecting a system operator, establishing theme, establishing editorial policies, and advertising to ensure a constituency.

Hardware Requirements

Plan on dedicating a microcomputer to the bulletin board system. Part time operation is usually not satisfactory and discourages continued patronage by callers.

The following hardware list is for the Capital PC User Group's "Remote Bulletin Board System" (RBBS). Other bulletin boards designed to operate on other vendor microcomputers have similar requirements.

Microcomputer Specifications:

- Intel 8088 or compatible microprocessor
- 256k of Random access memory
- Asynchronous Communications adapter (RS-232)
- 80 col by 25 line Monitor
- two 360 kilobytes floppy disk drives
  or
  one floppy disk drive and one hard disk (preferred)

Communications Specification:

- 300/1200 baud modem (direct connect-autoanswer) with Hayes compatible command language; 2400 baud modem should be procured where possible.

- Voice Grade telephone line with RJ-11 permissive jack connection

- RS-232 modem cable supporting at least the following pins: 1 through 8, 20 and 22

Optional Equipment:

- Printer to log activity
- Tape Backup system

For most applications, a computer with a hard disk is highly desirable; it provides a better response time, improving caller satisfaction and reducing the time they spend on the system.

A direct connect auto answer modem is required. Many bulletin boards are offering 2400 baud service, but 1200 baud is the predominant speed modem today. The additional cost of this higher speed modem is about $200, but halves the file transfer

time. This decreased time for transfers is important for systems offering large files for downloading.

A computer terminal must be available for the system operator to monitor the bulletin board. Monitoring of the bulletin board from remote locations is possible. Many system operators call in from home during weekends and holidays to check on messages.

A voice grade private telephone line is also required. The line must not be routed through the building switchboard nor have been assigned the "call waiting" option because the signal will disconnect the current caller. The local telephone company does require that they be informed of the type of device connected to the line including the Federal Communications Commission Registration number and the "ringer equivalent" value for that instrument. This information is usually imprinted on the bottom of the modem case. Because all calls are inbound, no call units or long distance charges should be experienced.

Software Requirements

The software listed below is representative of what would be required to operate a multi-line bulletin board system similar.

Bulletin Board System:

Software: Remote Bulletin Board System

Source: Capital PC Software Exchange
P.O. Box 6128
Silver Spring MD 20906
Price: $8 (Shipping and Handling charge)

Call Analyzer Software:

Software: Professional Analyzer for RBBS-PC

Source: AlphaSoft Systems
2508 Constance St
Atlanta Georgia 30344

Multi-line Software:

For those wanting to operate 2 lines the following multi-users, multi-tasking software package will work:

Software: Multi-link Advanced (Version 3.02 or higher)

Source: The Software Link, Inc
8601 Dumwood Place
Suite 632
Atlanta, George 30338

Selecting a System Operator

Someone must become the system operator or SYSOP. The SYSOP will be responsible for customizing the bulletin board software, creating sign-on screens, file directories, monitoring messages, performing routine maintenance on file directories and ensuring a smooth running bulletin board system. In short the system manager. It is not a full time job, but does require regular daily effort to ensure continuity. Figure 1 provides a list of duties a SYSOP must perform.

Establishing a Theme

Every successful bulletin board system has a central theme or specialty. Something of value that makes end users want to call the bulletin board. The Department of Commerce has a bulletin board that provides all the press releases issued by several federal agencies and the Federal Reserve Board on economic data. The National Weather Service sponsors two bulletin boards; one is titled, "Climate Assessment Board" and the other "East Coast Marine Users Board." Some private BBSs have public domain software or specialized conferences on programming languages. Without a theme, the SYSOP will have difficulty attracting new materials for updating the offerings.

Figure 1

SYSTEM OPERATOR RESPONSIBILITIES

1. Messages
   - Respond to inquiries for additional information
   - Delete old messages created by both the SYSOP and others
   - Add new messages to highlight new files or upcoming events

2. Files
   - Setup, update and delete file directories
   - Verify legitimacy of file contents
   - Monitor activity of files- deleting those with low activity

3. System Maintenance
   - Perform system backups weekly
   - Install new updates to system software (approx every 3 months)
   - Delete old entries from caller profile files by periodic packing.
   - Archive and reset comment and caller files.
   - Set up and monitor conferences.

A new bulletin board system must begin with some material. Once the board's central theme has been set, then material relating to that theme must be gathered and added to the board. Figure 2 describes a minimum set of articles and materials that should be on every board. Establishing a reputation for well written and technically high quality materials is important. Otherwise callers will not return to the board after the first time.

Figure 2

Minimum set of Files to Start a Bulletin Board

File Name	Description
Welcome	Sign-on message welcoming caller to system
Bulletin Directory	List of bulletin files found on system
Bulletins	Small text files about general interest topics
File Directory	List of topical sub-directories
File Sub-directory	List of actual text and binary files available for downloading.
Help	A set of text files keyed to specific transactions describing what must be done by caller.
Menu	A list of transactions available to the Caller.
Message	File containing messages. This file should have initial messages announcing the new bulletin board and establishing a theme for caller dialogue.

Editorial Policies

The type of callers attracted to the bulletin board is affected by the quality of articles and files found. The SYSOP sets the "editorial" tone by closely monitoring the message section. Obscene or "junk" messages left on the system for more than a single day or messages with radical opinions or statements tend to attract the same kind. A system that conveys a "strictly business" attitude will attract others to leave high quality responses.

Some areas in which policies needs to be set are:

- advertisements left by vendors
- announcements for local professional societies, and
- charitable organizations

SYSOPS in organizations with editorial review boards should work with those boards to develop new policies concerning materials to be placed on their bulletin boards. If no review board exists the SYSOP must exercise judgement. Because of the dynamic nature of the contents of electronic bulletin boards, much of the editorial review will have to be done by the SYSOP. This is a responsibility that should not be taken lightly.

One of the decisions to be made during the planning phase of a new bulletin board is whether two way information interchange is one of the objectives of the bulletin board. For many organizations, providing this service is not a high priority. One alternative is to limit message creation authority to a special group of callers. This group could be associates, other professionals or collaborators contributing materials to the bulletin board. Closing the message section to the general public minimizes the risk of inappropriate messages but also eliminates the option for information interchange and dialogue between callers.

Advertising

Getting the word out about a new bulletin board can be accomplished in several ways. They include:

- announcements at professional meetings,
- articles in professional publications,
- or leaving messages on other bulletin boards particularly those that keep a national list of bulletin boards.
- a brochure that can be mailed to those who inquire about the bulletin board.

Generally, it will take from 3 to 6 months for traffic to build up on a new bulletin board system.

2.2 Daily Operations

After the system has been established certain routine tasks must be performed on a regular schedule. They include: monitoring messages, refreshing bulletins and files, systems maintenance, security related precautions, traffic analysis and staffing.

Monitoring messages

The message section must be monitored everyday. The SYSOP can view all messages left on the board and can delete those that are old or unwanted. Callers rarely delete private messages, consequently that task falls on the SYSOP. Callers may also leave a private message for the SYSOP by using the Comments command. These messages should be answered daily.

Two important ways that the SYSOP can communicate with all callers besides leaving "public" messages is through special text files located in the bulletin section and the initial screen display sent during the sign-on sequence.

Bulletins

The bulletin section of the board provides a way for the SYSOP to make general announcements. These announcements are too long for the message section (over 30 lines) and need more visibility to callers than found in the file transfer section. The original concept was to have a few longer lived messages in a special bulletin section, similar to the bulletin board in the local super market. These messages don't get "pushed" down in the message section and are the first files seen by the caller after sign-on. This increase is attributed to the fact that files assigned to the file section of the bulletin board had to be "downloaded" to be viewed, a somewhat complicated procedure compared with selecting a number from the bulletin section menu.

Sign-on Messages

The first indication a caller has that they have connected to a bulletin board is a welcoming message appearing on their display screen. This message is usually no more than 20 lines and is displayed as part of the sign-on sequence. Its content includes a title block announcing the sponsoring organization along with some important lines directing callers to some particular section of the board. A sample sign-on screen from the MEIE system is shown in Appendix B.1.

Refreshing Bulletins and Files

An unattended system invites abuse and runs the risk of permitting by default illegal information such as credit card numbers. Additionally, information ages quickly and loses value. Callers will not return to a stale board. Regular review and deletion of all files must be done by the SYSOP.

Figure 3 shows the recommended retention periods for files.

Figure 3

File Retention Periods

Section Name	Type of Material	Retention Period
Welcome Messages	Caller Sign-on message Announcements	4 weeks 1 week after meeting date
Comments	Response to caller inquiries of SYSOP	4 days
Bulletins	Shorter files with general information	3 months
Files	Longer text files and software	3 months
System	Help and menu screens	Review and revise each new software update

Typically, messages have the shortest retention period and software the longest. Except for information describing the purpose of the bulletin board or the sponsoring organization all material should be refreshed every 3 months.

One of the mistakes many information contributors to electronic bulletin boards make is to put too much information on a single screen. Most callers become bored after the second successive screen full of the same information file. Additionally, screens that have more than 12-16 lines of information are too hard to read.

The use of graphic characters such as lines and boxes around directories and system help information greatly improves the readability. Figure 4 provides some guidelines on where to locate different types of files.

Many MEIE callers had difficulty accessing and transferring files found in the File Section. When popular, short text files were relocated to the Bulletin Section, their visibility was improved. Procedures for downloading files appear to be confusing and require the caller to have a computer.

Figure 4

Optimum Location for files

File Type	Section
Software (Binary files)	File
Announcements (Expire in 1 Week)	Message
Text (Under 4,000 char)	Bulletin
Text (over 4,000 char)	File

System Maintenance

The system operator must perform certain routine housekeeping functions to keep the system operating optimally. There are three system files which increase in size from normal traffic; they are the caller activity log, the caller identification file, and the message file. These files must be purged of inactive entries or in the case of the caller activity log, restarted. Maintenance of the caller identification file or the message files must be done with the bulletin board system off-line. Generally callers who have not signed onto the board for periods exceeding 1 or 2 months should be dropped to increase speed of caller verification and to minimize the potential of a new caller being denied access because they have the same first and last name as some other caller. As an example, the MEIE system drops about 50% of the callers from the identification file each time its reorganized.

Figure 5 shows the maintenance functions available to the SYSOP.

Figure 5

System Operator Functions

```
----------------- SYSOP'S UTILITIES -------------------

 1  List comments    2  List callers log   3  Recover a Msg
 4  Erase comments   5  Users maintenance  6  Toggle page bell
 7  Exit to DOS 2
```

These can be done from a remote location such as the SYSOPs home. The caller comment and caller activity logs can only be viewed from the SYSOP menu. Adding, changing, or deleting callers from the caller identification file is also accomplished using this menu.

Additional maintenance functions include system backup. All of the files associated with the bulletin board system should be archived as protection against hardware failures or malicious destruction by computer "Hackers." Depending on the amount of activity in the message section, the system should be archived at least weekly and perhaps every 2-3 days. Remember, in one year, a system running 24 hours per day, 7 days per week, will be operational nearly 8800 hours. A tape is recommended for bulletin board systems using hard disks for data files.

Security Precautions

Some callers are intrigued with the possibility of gaining control of system software and destroying it. Protection of these files and the data on a bulletin board requires certain precautions be taken. In general, certain transactions should be limited to a few callers known to the SYSOP. These include uploading of files, access to caller identification files, and exits to operating system functions. Any file uploaded to a bulletin board should be carefully checked on another computer. Some callers will upload files and programs with instructions that will destroy all files on disks drives on the computer system.

Traffic Analysis

Bulletin board system software maintain activity logs on callers. These activity logs record basic statistics such as caller name, time and place of call, communication protocols used and files accessed. The statistics can be summarized by other public domain software. Analysis of these operating statistics will provide a profile of the caller population and identify files that are popular. Figure 6 shows an example of the MEIE system caller traffic profile. Note system utilization percentage, distribution by communication baud rate, and most active file section. These statistics are useful in maintaining continued management support for the bulletin board.

Figure 6

MBIE Caller Statistics

Period: 01:44 AM 01-01-86 to 12:29 PM 01-27-86 - 27 DAYS

Communications Statistics:	**AVG: /DAY**	**TOTAL**	**%**
Remote master SYSOP sessions	0.4	11	
User calls at 2400 baud	2.9	77	7.7
1200 baud	18.5	499	50.3
300 baud	15.4	417	42.0
User calls at 8 data bits	30.3	819	82.5
7 data bits	6.4	174	17.5
Total user calls	36.3	982	
All calls (inc SYSOP)	36.7	993	

File Section Statistics:	**AVG: /CALL**	**/DAY**	**TOTAL**
Different files downloaded	0.1	3.8	102
Files downloaded: Total	0.44	16.1	436
w/XMODEM	0.36	13.2	357
w/ASCII	0.08	2.9	79
Files uploaded (from JrSYSOP)	0.0	0.0	1

System Control Stats:	**AVG: /Call:**	**/Day**	**Total**
Security violations		7.8	211
Locked out user attempts		0.1	4
Logons denied		1.0	28
Refusals to register		1.1	30
Password attempt failures		1.1	30
Password changes		0.4	11

System Utilization (Wall Clock Hours)			
System utilization (HHH:MM)	0:12.5	7:39	206:46
System up time (HHH:MM)		23:57	646:45
Percentage of utilization (time spent by callers on the system)			32%

Staffing

In order to minimize the time constraints on the SYSOP to perform all the functions discussed in this section, it is desirable to off-load tasks to others. This recruiting of others to contribute and assist in the ongoing operation of the bulletin board may be one of the biggest challenges for a SYSOP. One way to share the responsibility for refreshing files is to use junior SYSOPs. They can be given additional access privileges allowing them to upload files to the board and respond to inquiries. Most bulletin board system can be maintained remotely, meaning that all maintenance activities can be done from home or another location. This is an important feature for SYSOPs that travel.

3. Conclusions

Bulletin boards are contributing to computer and telecommunications literacy which will be important in the future as we achieve a critical mass of personal computers and a communications networks necessary to begin conducting more business activities electronically. Countless thousands of computer hobbyists and microcomputer users have contributed to the success of these bulletin boards. Public access to certain kinds of corporate information may well be the most important idea to come out of bulletin board systems. Organizational data security, high volume traffic, and transfer of multimedia documents must be addressed before public access to organizational information can become feasible.

This report has discussed issues relevant to establishing and operating electronic bulletin boards. Before starting a bulletin board, the following should be considered:

1. Free public domain software is available. This software can be reliable when mature, and can be installed by end users who do not know how to program computers.

2. Determine the "theme" or special purpose the electronic bulletin board is to serve.

3. Be prepared to dedicate a microcomputer, a direct connect modem, and telephone line full time to the bulletin board. This investment is usually under $3,000.

4. Someone (called a SYSOP) must be assigned responsibility for maintaining the bulletin board. About 2 days time is needed to install the software, 15-20 minutes each day to respond to inquiries and another 8 hours each month to perform regular housekeeping duties.

5. A continuing source of high quality information is required. It should be edited for viewing on computer terminals.

6. It takes about six months for a bulletin board to become established. Advertise the existence of the board at professional meetings, in trade journals, and on other bulletin boards.

7. Be sure to use activity and caller traffic data collection mechanisms provided by the bulletin board software. Take the time to analyze these traffic patterns and make the summaries available to the bulletin board sponsors. The statistics collected from operating a bulletin board may provide clues to new opportunities available to the organization for better customer service.

For the future, it is expected that bulletin boards will play an increasing role in enabling organizations to distribute information electronically and providing conferencing facilities to internal groups inexpensively. New versions of the software are incorporating options to establish bulletin boards on local area networks and on multi-user computers.

Additionally, there is a growing organizational concern for the ability to deliver products produced in-house to those outside the organization in electronic form (electronic product delivery). There are numerous questions raised by electronic product delivery related to security, the system's capacity for high volume caller traffic, and technology problems of mixing text, graphics, and image data in one document and transferring those files to a caller population with heterogeneous systems.

Based on experiences gained through running the MEIE system and working with other agencies establishing and operating their own bulletin boards, the Institute for Computer Sciences and Technology has initiated a project to determine the feasibility of electronic product delivery and to propose the best means of introducing electronic product delivery to the federal government. Later reports will document findings in this area.

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APPENDICES

Appendix A

Functional Features of a Bulletin Board System

Caller Sign-on Facilities

- Sense incoming calls and initiate session (auto-answer)
- Adjust host communication protocols to Callers protocol
- Display Bulletin board sign-on message and statistics
- List unread personal mail messages numbers
- Authenticate callers ID with password
- Permit first time callers to self register
- Record caller actions in an activity log

Peer to Peer Communications Facility

- Send and receive private messages
- Provide text editor for creating new messages
- Quick scan of messages by subject
- Select messages by number(s)
- Read messages in descending order
- Respond back to originator of personal messages
- Join or view special conferences

File Transfer Facility

- Download and upload ASCII (7-bit) or binary (8-bit) files
- List files available for transfer

System Operator Communications

- Leave messages to the SYSOP
- Provide facility for posting text files in a bulletin section
- Display short messages in BBS title screen

Caller Profile Facilities

- Remember caller's session preferences (i.e. menu display in expert/novice mode, line & page lengths, caller's last message read, and line feed preference.

Appendix B

Examples of Screen Displays

Appendix B.1

SESSION FOR NEW CALLER

CONNECT 2400 { **Initial message on caller terminal** }

WELCOME TO NBS MEIE NODE 2

What is your FIRST Name? **Carl** {**Prompt for name of caller**}
What is your LAST Name? **Caller**

Checking Users... {BBS searches for Caller ID in file}

{**ID not found so new caller routine started with questions about callers profile, then a new caller message displayed**}

What type of system are you calling from (Press [ENTER] if IBMPC)?

What is your CITY and STATE? **Gaithersburg MD**

{ **New Caller Message - Bulletin Board Code of Ethics**}

Welcome to the National Bureau of Standards - Microcomputer Electronic Information Exchange. Before continuing you should understand your responsibilities as a caller to this Federal Government sponsored bulletin board. Specifically they are:

1. Actively encourage the free exchange of information, ideas and opinions, except when the content would compromise the national security of the United States; violate proprietary rights, personal privacy, or applicable state/federal/local laws and regulations affecting telecommunications; or constitute a crime or libel.

2. Use your real name and fully disclose any personal, or commercial interest when commenting on a specific product or service.

FURTHER - every user explicitly acknowledges that all information obtained from MEIE is provided "as is" without warranty of any kind, either expressed or implied, and that mention of vendors and commercial products does not imply criticism of endorsement by the National Bureau of Standards.

. . . . .

```
CARL CALLER from GAITHERSBURG MD

                {Registration of caller profile started}

‹C›hange name/address, ‹D›isconnect (don't register), ‹R›egister? R

Enter PASSWORD you'll use to logon again?  MYPASSWORD

Re-enter PASSWORD for verification (Dots will Echo)? ..........

Please REMEMBER your password

CAN YOUR TERMINAL DISPLAY LOWER CASE (Y/N)? Y
UPPER CASE and lower
GRAPHICS wanted: ‹N›one, ‹A›scii, ‹C›olor, ‹H›elp? N

GRAPHICS: None
FILE transfer default type ‹A)scii, ‹X›modem, ‹C›Xmodem/CRC, ‹Q›uit? C

PROTOCOL: CRC

Want nulls (Y/N)? N

Nulls Off

Logging CARL CALLER

                {Start of regular Session}

RBBS-PC VERSION CPC13.1A NODE  2
OPERATING AT 2400 BAUD,N,8,1

* ‹Ctrl K› or ‹Ctrl X› aborts ‹Ctrl S› suspends *
        ------------------------------------------
        |          Welcome to the NBS/ICST       |
        |     Microcomputer Electronic Information|
        |              Exchange (MEIE)           |
        ------------------------------------------

Bulletin 33 has a complete list of all download files available

   PLEASE NOTE THAT THIS SYSTEM IS CURRENTLY MULTIUSER!!!!!
         You can use 948-5717  or 948-5718

Mention of vendors or product names does not imply criticism or
endorsement by the National Bureau of Standards or by the SYSOP.

                    Ted Landberg
                 Voice (301) 921-3485
```

```
==================== FUNCTIONS SUPPORTED ======================
     o Allow the use of menus with graphics characters in them
     o Send and receive messages with password protection
     o Download and upload 7-bit ASCII files
     o Download and upload 8-bit binary files using XMODEM protocol
     o List files available for download with directory number select
     o Save caller's expert/novice, prompt & page length preference
     o Save caller's last message read mark and line feed preference
     o List personal mail message numbers or says no personal mail
     o Quick scan and scan of messages with stacked number option
     o Read messages with stacked number or from last message read
     o Read SYSOP bulletins from bulletin menu

Would you like to skip the 50 bulletins? y

Checking messages..
RBBS-PC Version CPC13.1A Node  2

                    (Bulletin Board Statistics)

Caller #  28922  # active msgs: 9  Next msg # 29
56 minutes left

                  RBBS-PC   M E S S A G E   S Y S T E M
                  ---------------------------------------
-- C O M M U N I C A T I O N S --  --- UTILITIES --       - ELSEWHERE -
  PERSONAL        SYSTEM
P)ersonal Mail  B)ulletins                    H)elp
Q)uick Scan     C)omment                       L)ines per page     F)iles
R)ead Msgsn     I)nitial Welcome               X)pert on/off       G)oodbye
S)can Msgs                                     ?)List Functions    U)tili-
ties
             FOR  FEDERAL TRAINERS CONFERENCE ONLY

  J)oin Conference                  V)eiw Conference
  E)nter message for conference     K)ill message

Main Functions (B,C,D,E,F,G,H,I,J,K,L,O,P,Q,R,S,U,V,W,X,?) ? select one

                    CONTINUE SESSION AT THIS POINT

Main Functions (B,C,D,E,F,G,H,I,J,K,L,O,P,Q,R,S,U,V,W,X,?) ? G

Now 10:30 AM  Time on:  3 Min & 42 Sec
CARL, Thanks for calling and please call again!
NO CARRIER
```

BULLETIN DIRECTORY

B U L L E T I N M E N U

INFORMATION ABOUT ICST & NBS

1 - MEIE Information (1/85)

18- Info on the Institute for Computer Sciences & Technology (ICST) 9/85T)

19- ICST Newsletter -New (1/86)

33- Combined list of files in file Directories available for download (current thru 12/17)

YOU CAN DOWNLOAD BULLETIN FILES BY USING D:BULLETnn where nn is bulletin #

INFORMATION RESOURCE MGT TOPICS SPONSORED BY GSA

3 - GSA/OIRM IRM Clearinghouse (4/85)

20- IRM Institute Course Offering 9/85

21- Hands-on Microcomputer Courses 7/85

24- New IRM Handbooks (9/85)

26- GSA Correspond courses on Micro 9/85

28- Computer accommodations for users with disabilities 12/85

Extracted from the MEIE Bulletin Board

DIRECTORY OF SUB-DIRECTORIES

DIRECTORY OF DIRECTORIES

TO LIST A DIRECTORY, TYPE IN THE NUMBER OF THE DESIRED DIRECTORY (I.E. L;2 OR L;2;5;3)

DIRECTORY	GENERAL DESCRIPTION OF CONTENTS
2	INFORMATION SOURCES/EXCHANGE
3	RBBS 13.1A Software for downloading
4	MICROCOMPUTER TO MAINFRAME LINKS
5	LIST OF FEDERAL PUBLICATIONS
7	SOFTWARE ENGINEERING
11	SECURITY ISSUES QUESTIONS AND ANSWER FORUM
12	SECURITY INFORMATION SOURCES
13	SECURITY PRODUCT INFORMATION
14	SECURITY RELATED CONFERENCE INFORMATION
20	GSA IRM CLGHS ARTICLES
21	GSA IRM CLGHS PILOT PROJECTS/STUDIES
22	GSA IRM CLGHS RESEARCH AND DEVELOPMENT
23	GSA IRM CLGHS HANDBOOKS/TECHNICAL MANUALS
24	GSA IRM CLGHS SPEAKERS/INSTRUCTORS
25	GSA IRM CLGHS CALENDAR OF EVENTS
26	GSA IRM CLEARINGHOUSE CONTACTS AND IRM OFFICIALS
99	UPLOAD DIRECTORY (NOT OPEN TO GENERAL PUBLIC)

Extracted from the MEIE Bulletin Board

CALLER PROFILE FACILITIES

Callers may use a wide variety of terminals. Many use microcomputers with standard displays, but some call in on lap-top computers, communicating typewriters and "dumb" ASCII terminals. A set of display formatting options and other operating parameters are available to change session dialogues. Essentially these options allow the caller to adjust communication parameters, screen formats, or change passwords. A list of the common commands found in the MEIE bulletin board is shown below.

Caller Profile Change Commands

COMMANDS	SYSTEM
Case changes (upper/lower)	Baud rate (300-->450)
File transfer protocol	Help
Graphics	Password changes
Line feeds (on/off)	System statistics
Lines per page	Time on System
Message margin	* User Log (list entries)
Nulls (on/off)	* Who else is on system
Password changes	
Review user's preferences	
Expert (on/off)	
Prompt bell (on/off)	

The transactions with an * should be used with great care. Callers who wish to "intrude" will often scan these facilities to determine other callers signed-on currently. Many callers use their first or last name for their password. This provides the caller sufficient information to upload materials using someone else's identification.

The Message margin, Lines per page, Line feeds, Nulls, and Case changes are provided to allow callers to use the bulletin board with terminals having non-standard display screens. For example, some lap top microcomputers have only 8 lines from top to bottom and 40 character screen widths.

CALLER ACTIVITY FILE

This is the caller activity log which records all of the activities the caller performs during a session

WARREN BATTY on at 02-07-86, 3:13 PM from SILVER SPRING, MD, 1200 BAUD,N,8,1
Logged off at 3:14 PM

HARRY RODRIGUEZ on at 02-07-86, 3:00 PM from WASHINGTON DC, 300 BAUD,N,8,1
Carrier dropped at 3:05 PM

MOLLY GOLDBERG on at 02-07-86, 2:44 PM from BETHESDA MD, 1200 BAUD,N,8,1
Logged off at 2:57 PM
Exited Conference at 2:57 PM
Read Bulletin # 2 at 2:33 PM
Read Bulletin # 15 at 2:32 PM
Read Bulletin # 26 at 2:31 PM
Read Bulletin # 21 at 2:31 PM
Read Bulletin # 33 at 2:29 PM

LORI SMITH on at 02-07-86, 1:24 PM from ROCKVILLE, MD, 300 BAUD,N,8,1
Logged off at 1:28 PM

KIN HOPE of FALLS CHURCH,VA refused to register

HENRY PELLE on at 02-07-86, 11:31 AM from GIBBSTOWN, NEW JERSEY, 2400 BAUD,N,8,1
Logged off at 11:39 AM
NEWUSER at 11:34 AM

ROBB LINNEN on at 02-07-86, 10:44 AM from WESTLAKE, OHIO, 1200 BAUD,N,8,
Logged off at 11:30 AM
C:CONFIG.EQE Not enough time left!
C:RBBS-PC.EQE Downloaded at 11:29 AM using X
C:RBBS-PC.EQER Aborted at 10:47 AM using X

REAL MCCOY on at 02-07-86, 10:31 AM from ALEXANDRIA,VA, 1200 BAUD,N,8,1
Sleep Disconnect at 10:39 AM
SV!-MMenu J

CALLER IDENTIFICATION FILE

This is a listing of the caller identification file which contains the password, access level, last time on system, and file transfer activity.

```
245:BEN MARTEL                SECURITY    8 Password = SEASAME
    02-10-86 12:30   WASHINGTON DC            IBMPC
    DOWNLOADS = 23 UPLOADS = 0  Times on = 19 TIME USED = 37 Min

305:DICK GREGORY      SECURITY    3 Password = COMIC
    01-27-86 01:01    NASHVILLE,TN            IBMPC
    DOWNLOADS = 2 UPLOADS = 0 Times on = 5 TIME USED = 33 Min
```

Notes: SECURITY is the access level caller has on the system.
DOWNLOADS & UPLOADS is the number files transferred
TIME USED is the total time on system last session

Appendix C

XMODEM File Transfer Procedure

Data transmission errors may occur from electrical noise when transferring files between computers. XMODEM is a file transfer protocol for detecting data transmission errors and initiating the retransmissions of data that contains errors. Asynchronous communications does afford some error detection by checking for parity errors, but retransmissions is not automatically done.

The error-checking with the parity method is 95% effective when the receiving computer's software checks for parity errors. XMODEM error-checking is 99.6% effective.

XMODEM does not begin the transfer of data until the receiving computer signals the transmitting computer that it is ready to receive data. The Negative Acknowledge (NAK) character is used and is sent to the transmitting computer every 10 seconds until the file transfer begins. The file transfer must begin within 9 NAK's or the transfer is terminated.

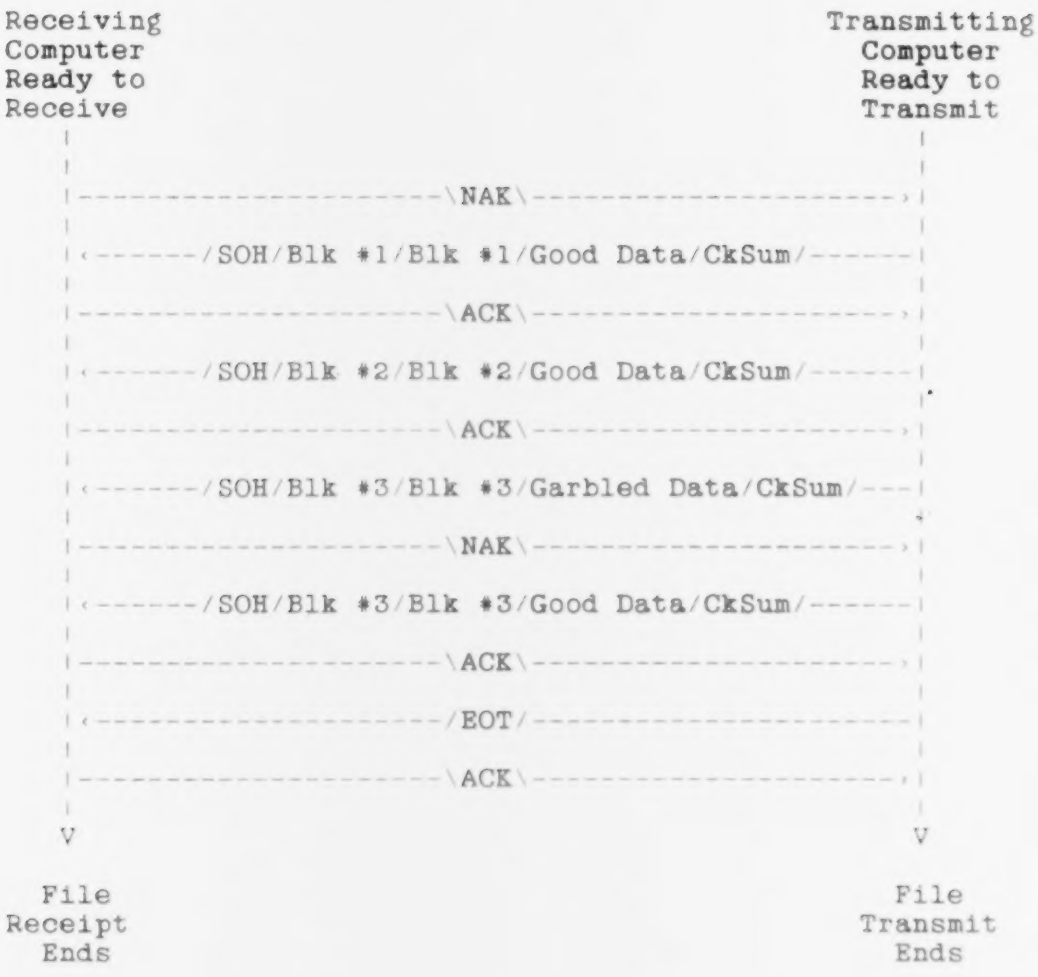
After a NAK is received, the transmitting computer uses a Start of Header (SOH) character and two block numbers (a true block number followed by a 1's complement of the number) to signal the start of a 128-byte block of data to be transferred then sends the block followed by an error-checking checksum. The checksum is calculated by adding the ASCII values of each character in the 128 character block; the sum is then divided by 255 and the remainder is retained as the checksum.

After each block of data is transferred, the receiving computer computes its own checksum and compares the result to the checksum received from the transmitting computer. If the two values are the same, the receiving computer sends an Acknowledge (ACK) character to tell the receiver to send the next sequential block.

If the two values are not the same, the receiving computer sends the transmitter an NAK to request a retransmissions of the last block This retransmissions process is repeated until the block of data is properly received or after 9 attempts the transfer is terminated.

XMODEM uses two block numbers at the start of each block to be sure the same block is not transmitted twice. The receiving computer checks the transmitted block to be sure that it is the one requested and blocks that are retransmitted by mistake are thrown away. An End of Transmission (EOT) character is transmitted to indicate the end of file [JORD83]. A sample XMODEM protocol session is illustrated below.

XMODEM File Transfer Session



XMODEM session copied from Capital PC User Group Software diskette # 41.

NBS-114A (REV. 2-8C)

U.S. DEPT. OF COMM. **BIBLIOGRAPHIC DATA SHEET** (See instructions)	1. PUBLICATION OR REPORT NO. NBSIR-86/3356	2. Performing Organ. Report No.	3. Publication Date APRIL 1986

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NATIONAL BUREAU OF STANDARDS
DEPARTMENT OF COMMERCE
WASHINGTON, D.C. 20234

7. Contract/Grant No.

8. Type of Report & Period Covered

9. SPONSORING ORGANIZATION NAME AND COMPLETE ADDRESS (Street, City, State, ZIP)

National Bureau of Standards

10. SUPPLEMENTARY NOTES

[ ] Document describes a computer program; SF-185, FIPS Software Summary, is attached.

11. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here)

Many organizations have established electronic bulletin boards to distribute information products electronically. For organizations that need to rapidly distribute press releases, product information, provide customer support or transfer data to a geographically dispersed constituency, electronic bulletin boards are proving to be an inexpensive solution.

Bulletin board software is a highly specialized application designed to accomplish a rather limited function of peer to peer communication. Each feature of a bulletin board has been developed to accomplish a different aspect of peer to peer communication. These features include sending and receiving messages, transferring files, and chatting with the system operator. However, bulletin board systems cannot search a textual data base by keyword, initiate other computer jobs or create and edit new data files.

12. KEY WORDS (Six to twelve entries; alphabetical order; capitalize only proper names; and separate key words by semicolons)

electronic bulletin boards, electronic product delivery, peer to peer communications, information exchanges

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